



U.S. Department of Energy's
Office of Science

Fusion Energy Sciences Program Update

Fusion Energy Sciences Advisory Committee



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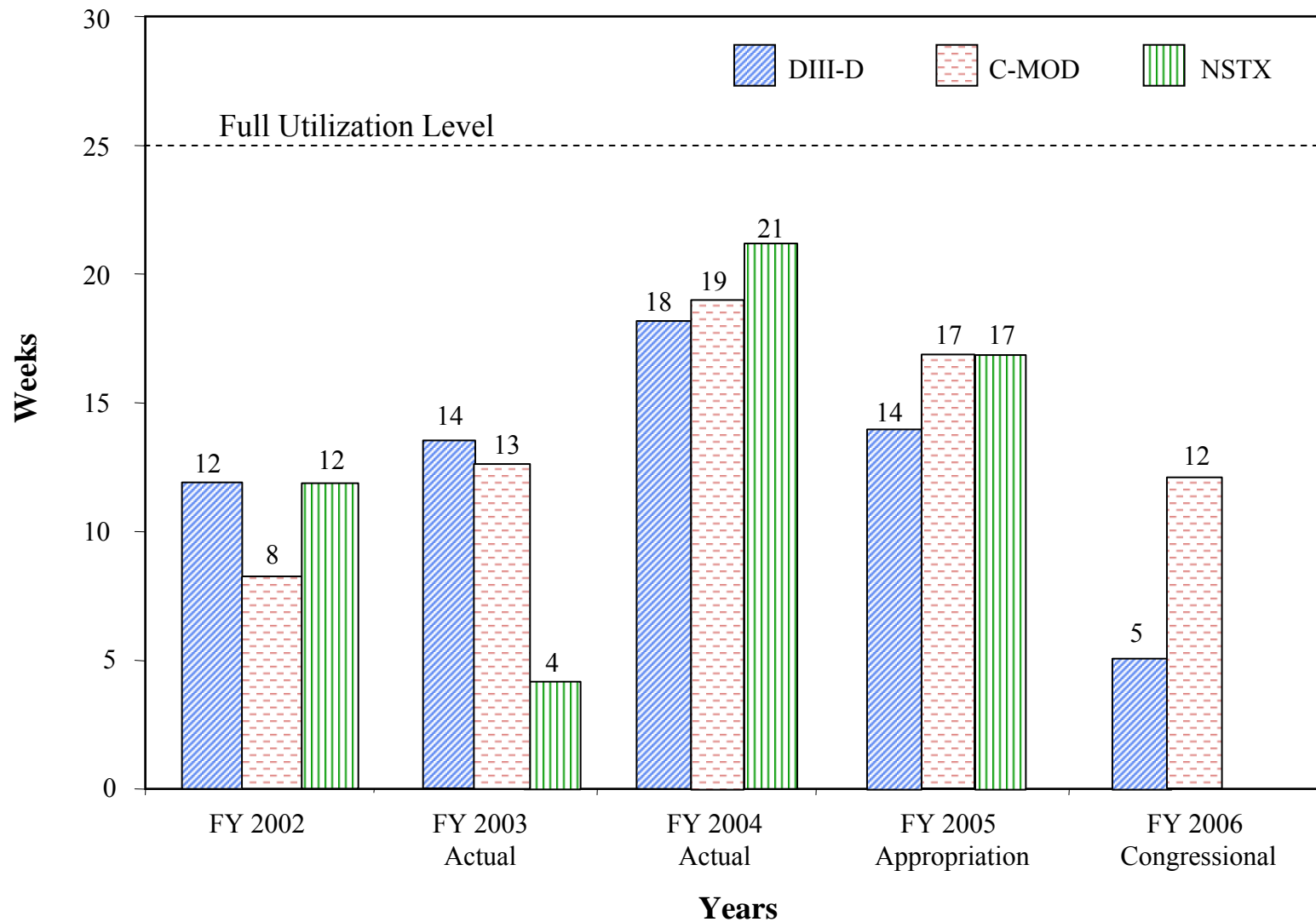
FY 2006 Fusion Energy Sciences Congressional Budget Request

	FY 2004 <u>Actual</u>	FY 2005 <u>Appropriation</u>	FY 2006 <u>Congressional</u>
Science	142.7	155.1	142.8
Facility Operations	85.7	89.9	127.5
Enabling R&D	<u>27.5</u>	<u>28.9</u>	<u>20.3</u>
<i>OFES Total</i>	<i>255.9</i>	<i>273.9</i>	<i>290.6</i>
DIII-D	54.4	55.7	51.4
C-Mod	22.3	22.0	21.5
NSTX	35.6	34.5	30.7
NCSX	16.7	18.3	16.6
ITER	3.2	4.9	55.5
Non-ITER	252.7	269.0	234.9

FY 2006 Fusion Program Highlights

- o **Begin U.S. ITER Fabrication Effort (\$55.5M, +\$50.6M)**
 - \$46M for MIE Project
 - \$3.5M for Enabling R&D support
 - \$6.0M for transitional activities that need to be completed before starting MIE
- o **Close out fusion materials science research (-\$7.3M)**
 - Shift materials research to BES
 - ITER will have to address materials needs as part of program
- o **Cut back HEDP Research (-\$7.2M)**
- o **Reduce Major Facility operations and research (-\$8.7M)**
 - No operation on NSTX, 5 weeks on DIII, 12 weeks on C-Mod
- o **Eliminate one major concept in ICC program (-\$3.4M)**
- o **Reduce NCSX to FY 04 level (-\$1.6M)**
 - Estimated 1 year delay and \$4.5M increase in cost
- o **Reduce Plasma Technologies to focus on ITER specifics (-\$4.2M)**
- o **Other reductions in Theory, Advanced Design and SBIR (-\$2.1M)**

Major Fusion Facilities Operating Times



FY2006 Final ITER Preparations and Start of the U.S. Contributions to ITER MIE Project – Total of \$55.5M

	<u>FY 2004</u>	<u>FY 2005</u>	<u>FY 2006</u>
ITER Preparations	\$3.0M	\$5.0M	\$6.0M *
ITER Major Item of Equipment Project			
Annual Total Estimated Cost (TEC) Funding	0	0	\$46.0M
ITER Major Item of Equipment Project			
Annual Other Project Cost (OPC) Funding	0	0	\$3.5M

- Preparations funding - completion of the ITER Transitional Arrangements, a framework used in anticipation of an International ITER Agreement. These ITA activities involve all six ITER Parties and provide analyses of various transitional issues including safety, licensing, project management, preparation of specifications and system integration and for the continuation of various technical activities of the U.S. scientists and engineers in laboratories, universities, and industry.
- TEC funding - procurement, fabrication and delivery of medium- and high- technology components, assignment of U.S. personnel to the ITER Organization abroad, and a provision of cash for the U.S. share of common costs at the ITER site for installation and testing.
- OPC funding - R&D and design in support of magnets, plasma facing components, tritium processing, fueling and pumping, heating and current drive, materials, and diagnostics.

* Discussions are under way about whether ITER Preparations funding in FY06 should be accounted for within the ITER Other Project Costs (OPC) and therefore the ITER Total Project Cost (TPC).

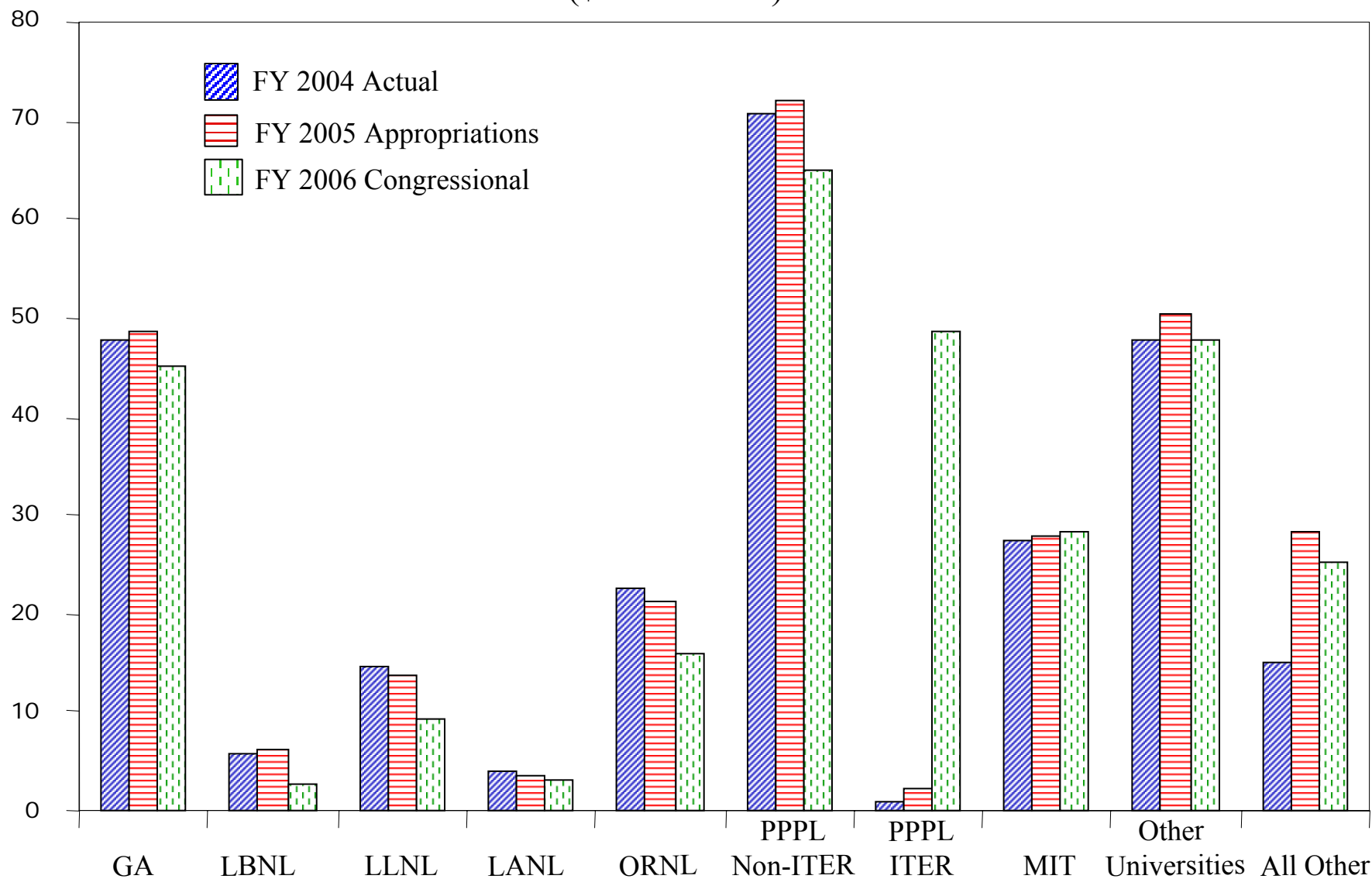
Fusion Energy Sciences Budget by Institution

(\$ in Millions)

<u>Institution</u>	FY 2004 <u>Actual</u>	FY 2005 <u>Appropriation</u>	FY 2006 <u>Congressional</u>
General Atomics	47.6	48.3	45.2
Lawrence Berkeley National Lab	5.8	6.1	2.6
Lawrence Livermore National Lab	14.4	13.5	9.2
Los Alamos National Lab	3.9	3.5	3.2
Oak Ridge National Laboratory	22.5	20.7	15.8
Princeton Plasma Physics Lab—Non ITER	70.5	71.8	64.8
Princeton Plasma Physics Lab--ITER	1.0	2.4	48.5
Massachusetts Institute of Technology	27.3	27.8	28.2
Other Universities	47.7	50.6	47.8
All Other	<u>15.2</u>	<u>29.2</u>	<u>25.3</u>
<i>Total</i>	<i>255.9</i>	<i>273.9</i>	<i>290.6</i>

Fusion Energy Sciences Funding by Institution

(\$ in Millions)



ITPA, IEA, ITER Physics and Burning Plasma Program

- o Our collaborations are evolving where
 - ITPA provides topical focus on Burning Plasma physics issues (Ron Stambaugh's talk)
 - Facility based IEA Agreements (Large Tokamaks, Poloidal Divertors, TEXTOR) provide implementation of exchanges on international facilities
- o Contributes to Burning Plasma Program and ITER Physics
- o ITPA is expected to be extended for another two years from July 2005;
- o IEA FPCC is developing a 3 Year Mandate to support ITER and its Accompanying Program;
- o We are establishing a Burning Plasma Program;
 - Useful community discussions at the BPM

Site Negotiations News

- o EU has visited recently Russia, China, Korea, Japan and the US to explain recent actions by Council of Ministers and future plans.
- o All parties maintain their preference for the 6-party framework.
- o Upcoming meetings that could play a role in a site selection decision are:
 - April 12 (EU Commissioner Potocnik and Japanese Minister Nakayama)
 - April 18 (EU Competitiveness Council Meeting)
 - June 5-6 (final Competitiveness Council Meeting under Luxembourg Presidency).
- o Both Council meetings will be addressing preparation of the Seventh Framework Program, including the ITER construction budget.

Lehman Readiness Review for DOE Order 413.3 Critical Decision 1

Findings from Preliminary Cost and Schedule Range Review

U.S. Contributions to ITER Project

March 22-24, 2005

- o Project has made good progress despite a significant number of uncertainties such as the site, Director General, key staff, agreement.
- o Project scope is provisional until the agreement is in place.
- o Uncertainties affect many U.S. ITER project planning assumptions; however, most essential plans and documents needed for CD-1 have been drafted.
- o Proposed cost range is too narrow and is inconsistent with the number and nature of uncertainties listed above. As minimum, contingency is needed for ITER Organization activities.
- o The Committee recommends the U.S. ITER project proceed with CD-1 after updating the cost range and acquisition strategy, and documenting plans for value engineering.

Factors Affecting the Start of the “U.S. Contributions to ITER” MIE Project

- o FY2006 President’s Budget includes \$49.5M for the Major Item of Equipment project start, and \$6M for completion of U.S. ITER preparations.
- o By mid-2005, if site is selected and the Director General is appointed, the following actions will be phased in beginning in early FY2006: (blue indicates action by all ITER parties, red indicates a U.S.-only action)
 - Send secondees to international ITER project site.
 - Consult with Congress on Agreement matters (could start earlier)
 - Obtain Circular 175 authorizing the U.S. to sign the ITER Agreement.
 - Proceed with international activities under the ITER Transitional Arrangements framework (until the ITER Organization is formed)
 - Proceed to initial, sign, and obtain ‘ratification’ of the ITER Agreement.
 - Proceed with long lead procurements.
 - Form the international ITER Organization.

Fusion Simulation Project Status

- o The Fusion Simulation Project (FSP) will unify and accelerate progress on a complete, integrated simulation and modeling capability for ITER-class burning plasma
- o Creating this capability entails integrating physics that heretofore has largely been considered in isolation
- o In FY 2005, OFES and OASCR will begin the first phase of the FSP by conducting initial integration efforts called “Focused Integration Initiatives” in the FESAC Report
- o One project will be started in FY 2005

OFES FY 2005 Solicitation

Innovative Confinement Concept

- o Proposals due 6/23/2005. Funding decision scheduled for mid November.
- o A Special Review due to a funding cutback in the CE ICC program of about \$2.5M relative to FY05
- o Projects which are normally due for review in 2005: SSPX (Spheromak at LLNL), TCS (FRC at U. Washington), Pegasus (ST at U. Wisconsin), HIT-SI (U. Washington), HBT (High-beta Tokamak at U. Columbia), FRC at Princeton.
- o Major CE projects included in the Special Review: MTF (Magnetized Target Fusion at LANL and AFRL, HSX at U. Wisconsin, Levitated Dipole at MIT/U. Columbia, Lithium Tokamak at PPPL).
- o If funding level is restored later, the review will drop back to the normal review - the Special CE projects will be exempted.

Junior Faculty

- o 6 proposals under review
- o Decision due in June 2005
- o Expect to fund 3 at ~ 150K each

OFES FY 2005 Solicitation (continued)

Innovative HEDP – Fast Ignition and Plasma Jets

- o Due to the timing of the Congressional Add-On, the timeline for the solicitation and award process is unusually short – less than 5 months (Usually it takes 7 - 8 months)
- o Solicitation posted December 8, 2004
- o Applications closed February 3, 2005
- o Received 18 non-Lab proposals, 5 Lab proposals
- o Peer reviews currently in progress
- o Peer-reviewer comments expected April 20, 2005
- o Proposers will be given an opportunity for rebuttal
- o Funding decisions scheduled for the first week of May
- o Selection Panel: Francis Thio, Ken Hill, Ralph Schneider (NNSA), L K Len (HEP)

OFES FY 2005 Solicitation (continued)

Scientific Discovery through Advanced Computing – Fusion Simulation Prototype Centers (new in FY 2005)

- o \$1M per year OFES
- o \$1M per year ASCR
- o Five-year funding beginning in FY 2005
- o Four proposals received by March 23, 2005
- o Award Selection – May 27, 2005 (one proposal to be funded)

NSTX Research

- o 16 proposals received by October 14, 2004 (11 renewals, 5 new)
- o 9 of 11 renewals funded
- o 1 of 5 new proposals funded (Old Dominion University/Polish Academy of Science)
- o \$1.4M per year for FYs 2005-2007
- o Selection decisions posted on OFES web site

OFES FY 2005 Solicitation (continued)

General Plasma Physics Program Supported at the DOE Laboratories (Lab 05-06)

- o The program to fund General Plasma Physics at the DOE labs was last competed in 2000
- o The Program Announcement Lab 05-06 for “Opportunities in Basis Plasma Science” was posted on the SC-64 website on December 7, 2004
- o 18 applications were received at the end of February 2005 and they have been sent out for review
- o Reviews should be in by the end of April 2005.

Ten Year Goals for Fusion Energy Sciences

- o Demonstrate progress in developing a predictive capability for key aspects of burning plasmas using advances in theory and simulation benchmarked against a comprehensive experimental database of stability, transport, wave-particle interaction, and edge effects. **(2015)**
- o Demonstrate progress in developing the fundamental understanding and predictability of high energy density plasma physics, including potential energy producing applications. **(2015)**
- o Demonstrate enhanced fundamental understanding of magnetic confinement and in improving the basis for future burning plasma experiments through research on magnetic confinement configuration optimization. **(2015)**

Program Plan for Fusion Energy Sciences: Roadmap of Objectives and Performance Targets

